

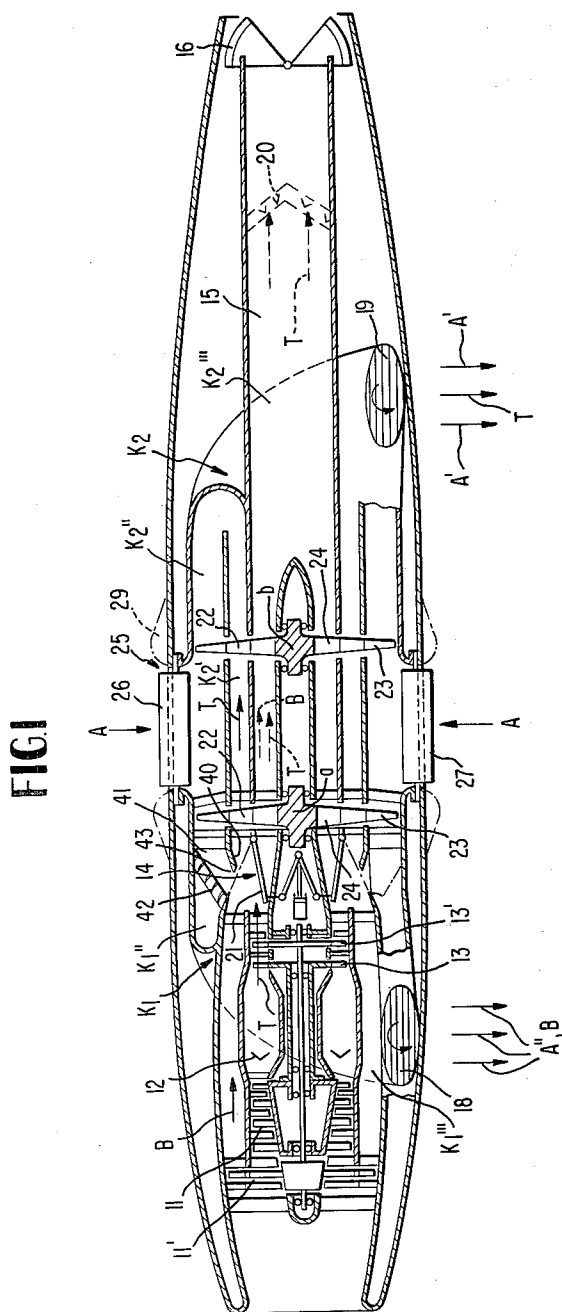
June 14, 1966

H. J. GRIEB
TWO-STAGE GAS TURBINE PROPULSION JET
UNIT WITH THRUST DIVERTING MEANS

3,255,585

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2 Sheets-Sheet 1



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FIG. 2

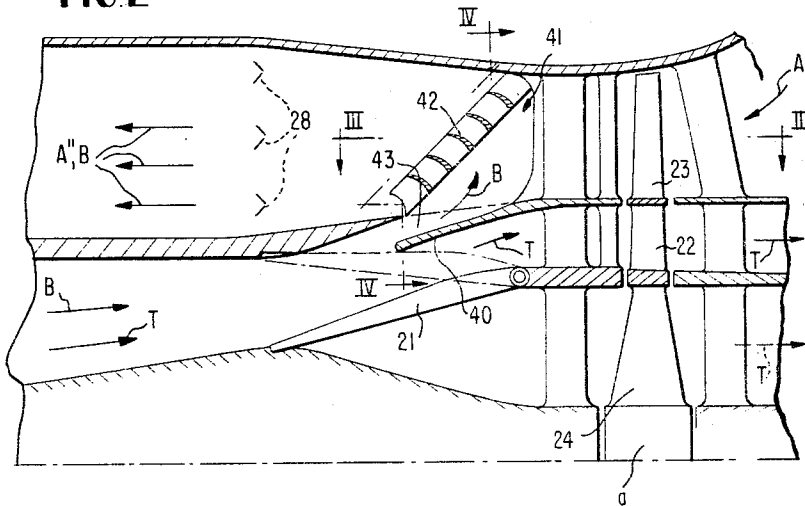


FIG. 3

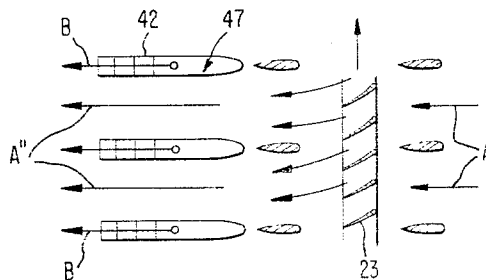
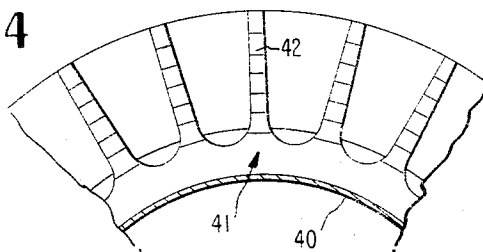


FIG. 4



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TWO-STAGE GAS TURBINE PROPULSION JET UNIT WITH THRUST DIVERTING MEANS

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17 Claims. (Cl. 60—35.54)

The present invention relates to a two-stage propulsion unit, and more particularly relates to a further development and improvement of the subject matter of my co-pending application Ser. No. 301,452, filed August 12, 1963. The two-stage gas turbine jet propulsion unit for propelling vertical take-off and short-start airplanes according to the aforementioned co-pending application comprises a first stage consisting of a base propulsion unit having one or several air compressors, of one or several combustion chambers, of one or several compressor-drive turbines, and of a channel branching means controlled by valves or similar control elements; the channel branching means thereof continues in a horizontal thrust channel extending in the longitudinal axis of the propulsion unit and in a lift channel bent perpendicularly or nearly perpendicularly to the propulsion unit longitudinal axis, within which rotate the turbine blades of compressor rotors arranged perpendicularly to the longitudinal axis of the propulsion unit which, in turn, draw in atmospheric air for the second stage (the lift stage) and also supply air into the lift channel system; the lift channel system, in turn, consists of two bifurcated channel branches, and more particularly of a forward, initially forwardly directed and thereupon downwardly bent lift channel branch through which only air of the second propulsion stage is supplied, and of a rearward, initially only rearwardly directed and thereupon downwardly bent lift channel branch which is supplied with the propulsion gases of the first propulsion unit stage and simultaneous with air of the second propulsion unit stage, whereby the section of the lift channel-system disposed in front of the elbows or curved portions—as viewed in the direction of the lift flow—consists of a turbine channel portion arranged coaxially to the horizontally extending thrust channel and adjoining the channel branching means, and of an air channel portion surrounding the latter and having air inlet means located along the propulsion unit circumference, and whereby the lift compressor rotors carry radially outwardly thereof the air compressor blade rim, radially centrally thereof the turbine blade rim and radially inwardly thereof a spoke rim which is aerodynamically ineffectual and rotates within the horizontal thrust channel.

The present invention aims, in addition to an optimizing of the performance values during horizontal flight, above all at so constructing the over-all propulsion unit and to take such measures that a favorable propulsion-medium distribution is achieved during the vertical and transitional flights between the forward and rearward portions of the lift system and therewith between the forward and rearward lift nozzles.

In solution of the underlying problems, it is proposed in accordance with the present invention to equip and construct the base propulsion unit as two-stage propulsion unit (with an additional input-connected compressor or

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aft-fan or an output-connected compressor) whose outwardly disposed cold air stream is derived during the lift operation from the flow channel system of the base propulsion unit and is thereby conducted to the forward section of the lift system.

According to the basic concept of the present invention, at first the two following possibilities come to one's mind: Either to conduct the outwardly disposed, cold air stream or flow, supplied by the compressor of the second stage of the base propulsion unit, which is constructed as input or front compressor, during lift operation spatially separated from the forward lift stream or flow, produced by the compressor blading of the forward lift compressor rotor, up to shortly in front of the forward lift nozzles, already present according to the construction of my co-pending application through which then the two air streams or flows are discharged in unison into the atmosphere, or to conduct the air stream or flow of the input or front compressor completely separate from the stream or flow of the forward lift compressor rotor up to additional forward lift nozzles.

However, in the following, the present invention is concerned only with the further development of a third possibility to conduct the outwardly disposed, cold air stream supplied by the compressor (input compressor or aft-fan or output-connected compressor) of the second stage of the base propulsion unit, during the lift operation and the transitional operation directly into the forward air channel branch of the lift channel system. This takes place according to a further feature of the present invention through a controlled overflow aperture which leads from the flow channel of the base propulsion unit within the area of the channel branching, in front of the forward lift compressor rotor, into the forward lift channel branch.

In order to achieve an equalization of the static pressures of the two air streams to be mixed, i.e., of the air stream produced by the compressor of the second stage of the base propulsion unit and of the air stream supplied by the forward lift compressor rotor, it is further proposed in accordance with the present invention to accelerate initially, prior to mixing of these two air streams, the first-mentioned air stream by an appropriate means, such as a guide baffle, and thereupon to conduct the same into the air stream of the lift compressor rotor.

Accordingly, it is an object of the present invention to provide a two-stage gas turbine jet propulsion unit of the type described above which further improves by simple means the two-stage gas turbine jet propulsion unit described in my co-pending application.

Another object of the present invention resides in the provision of a two-stage gas turbine jet propulsion unit for vertical take-off or short-start airplanes capable of producing both lift and horizontal thrust, which is relatively simple in construction, yet provides a high efficiency and therewith relatively high outputs for a given system, especially during take-off and transitional flights.

A further object of the present invention resides in the provision of a two-stage gas turbine propulsion unit for use with vertical take-off or short-start airplanes which assures a favorable distribution of the propellant medium during vertical flights as well as transitional flights from vertical to horizontal flight.

Still another object of the present invention resides in the provision of a two-stage gas turbine propulsion unit for vertical take-off or short-start airplanes having

a lift system provided with lift nozzles spaced in the axial direction of the unit which assures a proper distribution of the propellant medium to the various lift nozzles.

A still further object of the present invention resides in the provision of a two-stage gas turbine jet propulsion unit for vertical take-off or short-start airplanes in which the static pressures of any air streams to be mixed are matched to one another by extremely simple means.

These and other objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing, which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein:

FIGURE 1 is a longitudinal cross-sectional view through a two-stage propulsion unit with two lift compressor rotors in accordance with the present invention;

FIGURE 2 is a partial longitudinal cross-sectional view, on the enlarged scale, of a portion of FIGURE 1, illustrating the part thereof within the area of the channel branching 14;

FIGURE 3 is a cross-sectional view on an enlarged scale, taken along line III—III of FIGURE 2; and

FIGURE 4 is a cross-sectional view, on an enlarged scale, taken along line IV—IV of FIGURE 2.

Referring now to the drawing wherein like reference numerals are used throughout the various view to designate like parts, the base propulsion unit itself is constructed as two-stage propulsion unit and comprises a front or input compressor 11' which is driven by a low-pressure turbine 13', and a high-pressure compressor 11 which is driven by the high-pressure turbine 13 and supplies air into the combustion chambers 12. In lieu of a front or input compressor a so-called "aft-fan" or output compressor may be used which is driven by way of a shaft from the working turbine. A horizontal thrust channel 15 provided with a horizontal thrust nozzle 16 adjustable in cross-section adjoins the channel branching means, generally designated by reference numeral 14. The entire lift channel system consists of a forward lift channel branch generally designated by reference character K_1 and of a rear lift channel branch generally designated by reference character K_2 . The channel branching means 14 which is controlled by a valve or flap 21 is adjoined, on the other hand, by a turbine channel section K_2' which is surrounded by air channel sections K_1'' and K_2'' which both terminate in downwardly bent elbow sections K_1''' and K_2''' at whose end are provided pivotal thrust nozzles 18 and 19. The channel sections K_2' , K_1'' , and K_2'' thus extend coaxially about the forward section of the horizontal thrust channel 15. An afterburner installation 20 of any known construction may be installed into the rear section of the horizontal thrust channel 15.

Two lift compressor rotors *a* and *b* are freely rotatably supported within the engine housing of the propulsion unit. The rotors *a* and *b* carry turbine blades 22, which rotate within the propellant gas channel section K_2' , and air compressor blades 23, which rotate within the air channel sections K_1'' and K_2'' . Additionally, the rotors *a* and *b* are provided with aerodynamically ineffectual spokes 24 which rotate within the thrust channel 15.

The air inlet generally designated by the reference numeral 25 of the lift compressor stage is controlled by pivotal valves or flaps 26 and by air scoops 27 adapted to be extended and retracted within the lower section of the propulsion unit circumference. The aerodynamic conditions at the propulsion unit or airplane are improved, as is well known, by expandable beads or inflatable bulged rims 29 in the suspended or transitional flight.

The possibility also exists to arrange within the lift channel, fuel-injection installations 28 (FIG. 2) for the increase in thrust.

OPERATION

The propulsion unit illustrated in FIGURE 2 operates as follows: In suspended and transitional flight; that is, during lift operation, the control valves 21 are in a position thereof shown in full lines; that is, the horizontal flight channel 15 is closed. The propellant gases *T* leaving the compressor-drive turbines 13 and 13' flow into the lift channel system; they thereby act upon the turbine blades 22 of the rotors *a* and *b* rotating within the channel part K_2' and flow thereupon through the elbow section K_2''' , whereupon they leave again the propulsion unit through the rearward, pivotal thrust nozzles 19. The air inlet valves 26 and air inlet scoops 27 are in the afore-described flight condition in the open position thereof so as to permit inflow of atmospheric air *A*, of which a part is drawn-in by the compressor blades 23 of the lift compressor rotor *b*, is compressed by the latter and supplied into the elbow section K_2''' . The propellant gas jet leaving the two thrust nozzles 19 is therefor composed of an inner hot stream of turbine gases *T* and of an outer jacketing stream of compressed, substantially cooler air *A'*.

During the lift operation also the forward lift compressor rotor *a* supplies air *A''* (see FIGURES 2 and 3) into the forward lift channel branch K_1 . Simultaneously therewith, the outwardly disposed air *B*, supplied by the input or front compressor 11' is conducted with the aid of a collector or scoop ring 40 arranged within the channel branching means 14 through an aperture 43 into a star-shaped deflection means, generally designated by reference numeral 41 (FIGURE 4) which is adjoined by an accelerating baffle or blading 42, within which the static pressure of the air stream *B* is matched to the pressure of the air stream *A''* which flows through the deflection installation 41 spatially separated from the air stream *B*. To the rear or downstream of the deflection installation 41 and the accelerating blading 42, the two air streams *A''* and *B* are mixed with each other and reach the atmosphere through the forward, pivotally arranged thrust nozzles 18.

The thrust nozzles 18 and 19 are so constructed and adjustable in a conventional manner that the propellant gases *A'* and *T* or *A''* and *B* are able to leave in a direction adjustable from a vertical to a horizontal direction.

During horizontal flight, the shifting valve 21 assumes the position thereof shown in dash lines; the air inlet devices 26 and 27 thereby close the body about the nacelle and therewith close off the lift stage against the atmosphere. The propellant gases *T* now flow exclusively through the horizontal thrust channel 15 without driving the lift compressor rotors *a* and *b* since the spokes 24 thereof are aerodynamically ineffectual.

While I have shown and described one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art; for example, the present invention is also applicable to all modifications described in my co-pending application; and I, therefore, do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising: a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means, horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and

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adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward first lift channel means through which only air of the second lift propulsion stage is adapted to be supplied and a rearward second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage, the lift channel system including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said lift channel branch means.

2. The combination according to claim 1, wherein said additional compressor means is an input compressor.

3. The combination according to claim 1, wherein said additional compressor means is an aft-fan.

4. The combination according to claim 1, wherein said additional compressor means is an output compressor.

5. The combination according to claim 1, wherein said relatively cold air flows radially outwardly of the flow channel system of said one stage.

6. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward first lift channel branch means through which only air of the second lift propulsion stage is adapted to be supplied and a rear-

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ward second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage,

the lift channel system including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

said further means conducting the relatively cold air supplied by said additional compressor means of the base propulsion unit, during lift and transitional operating condition, spatially separated from the forward air stream produced by the compressor blading of the forward compressor rotor means, up to a predetermined point in the first lift channel branch means.

7. The combination according to claim 6, further comprising nozzle means at the discharge end of each lift channel branch means, and wherein said further means conducts said relatively cold air stream spatially separated from said forward air stream up to shortly in front of the nozzle means of said first lift channel branch means, whereby said two last-mentioned air streams are discharged in unison through said last-mentioned nozzle means.

8. The combination according to claim 6, further comprising nozzle means at the discharge end of each lift channel branch means, and wherein said further means conducts said relatively cold air stream spatially separated from said forward air stream to forward nozzle means separate from the nozzle means of said first lift channel branch means.

9. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward first lift channel branch means through which only air of the second lift propulsion stage is adapted to be supplied and a rear-

ward second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage,

the lift channel system including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

the relatively cold air stream being conducted during lift and transitional operating condition into said first lift channel branch means of the lift channel system through a controlled overflow aperture within the area of said channel branching means.

10. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means.

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward first lift channel branch means through which only air of the second lift propulsion stage is adapted to be supplied and a rearward second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage,

the lift channel system including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air

flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said lift channel branch means,

and means for substantially matching within the air channel section of said lift channel system the pressure of the relatively cold air stream supplied by said additional compressor means to the pressure of the air stream supplied by the forward lift compressor rotor means, prior to mixing therewith.

11. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means arranged substantially perpendicularly to the longitudinal axis of the unit, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward, initially forward directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage,

the portion of the lift channel system disposed ahead of the bent sections of the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means.

12. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor

means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially 5 in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion 10 unit including a lift channel system and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air 15 into the lift channel system,

said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the 20 second lift propulsion unit stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with the propellant gases from the base propulsion unit 25 and with air of the second lift stage,

the portion of the lift channel system disposed ahead of the bent sections the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section 30 extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with an air inlet means disposed along the circumference of the 35 propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from 45 the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

scoop means arranged within the area of said channel branching means, disposed in the flow channel system of the base propulsion unit in front of the forward lift compressor rotor means, for separating said relatively cold air stream from the hot turbine gases, and substantially star-shaped deflection means provided with after-connected accelerating baffle means 50 in the first lift channel branch means in front of the forward compressor rotor means for said relatively cold air stream, said relatively cold air stream being mixed to the rear of said baffle means with the air supplied by said forward compressor rotor means which flows through said baffle means spatially separated from said relatively cold air stream.

13. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising: 60 a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially 70 in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit and adapted to be connected with said base propulsion 75

sion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit stage and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion unit stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with the propellant gases from the base propulsion unit and with air of the second lift stage,

the portion of the lift channel system disposed ahead of the bent sections the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

scoop means arranged within the area of said channel branching means, disposed in the flow channel system of the base propulsion unit in front of the forward lift compressor rotor means, for separating said relatively cold air stream from the hot turbine gases, and substantially star-shaped deflection means provided with after-connected accelerating baffle means in the first lift channel branch means in front of the forward compressor rotor means for said relatively cold air stream, said relatively cold air stream being mixed to the rear of said baffle means with the air supplied by said forward compressor rotor means which flows through said baffle means spatially separated from said relatively cold air stream,

said scoop means including rigid air scoop ring means directed obliquely with respect to the flow of air.

14. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising: a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system and lift compressor rotor means having turbine blade means, said

compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit stage and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion unit stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with the propellant gases from the base propulsion unit and with air of the second lift stage,

the portion of the lift channel system disposed ahead of the bent sections the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

the relatively cold air stream being conducted during lift and transitional operating condition into said first lift channel branch means of the lift channel system through a controlled overflow aperture within the area of said channel branching means,

scoop means arranged within the area of said channel branching means, disposed in the flow channel system of the base propulsion unit in front of the forward lift compressor rotor means, for separating said relatively cold air stream from the hot turbine gases, and substantially star-shaped deflection means provided with after-connected accelerating baffle means in the first lift channel branch means in front of the forward compressor rotor means for said relatively cold air stream, said relatively cold air stream being mixed to the rear of said baffle means with the air supplied by said forward compressor rotor means which flows through said baffle means spatially separated from said relatively cold air stream,

said valve means controlling the channel branching means closing the overflow aperture leading into the air channel section of said lift channel system and simultaneously covering said air scoop ring means against both air streams.

15. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion

unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system and lift compressor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit stage and supplying air into the lift channel system,

said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion unit stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with the propellant gases from the base propulsion unit and with air of the second lift stage,

the portion of the lift channel system disposed ahead of the bent sections the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

scoop means arranged within the area of said channel branching means, disposed in the flow channel system of the base propulsion unit in front of the forward lift compressor rotor means, for separating said relatively cold air stream from the hot turbine gases, and substantially star-shaped deflection means provided with after-connected accelerating baffle means in the first lift channel branch means in front of the forward compressor rotor means for said relatively cold air stream, said relatively cold air stream being mixed to the rear of said baffle means with the air supplied by said forward compressor rotor means which flows through said baffle means spatially separated from said relatively cold air stream,

said deflection means being so constructed that an acceleration of the air stream already takes place therein.

16. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

a second propulsion stage forming the lift propulsion unit including a lift channel system and lift compressor

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sor rotor means having turbine blade means, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit stage and supplying air into the lift channel system,

5 said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion unit stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with the propellant gases from the base propulsion unit and with air of the second lift stage,

10 the portion of the lift channel system disposed ahead of the bent sections the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

15 said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

20 and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

25 said further means conducting the relatively cold air supplied by said additional compressor means of the base propulsion unit, during lift and transitional operating condition, spatially separated from the forward air stream produced by the compressor blading of the forward compressor rotor means, up to a predetermined point in the first lift channel branch means,

30 the relatively cold air stream being conducted during lift and transitional operating condition into said first lift channel branch means of the lift channel system through a controlled overflow aperture within the area of said channel branching means,

35 and means for substantially matching within the air channel section of said lift channel system the pressure of the relatively cold air stream supplied by said additional compressor means to the pressure of the air stream supplied by the forward lift compressor rotor means, prior to mixing therewith,

40 scoop means arranged within the area of said channel branching means, disposed in the flow channel system of the base propulsion unit in front of the forward lift compressor rotor means, for separating said relatively cold air stream from the hot turbine gases, and substantially star-shaped deflection means provided with after-connected accelerating baffle means in the first lift channel branch means in front of the forward compressor rotor means for said relatively cold air stream, said relatively cold air stream being mixed to the rear of said baffle means with the air supplied by said forward compressor rotor means which flows through said baffle means spatially separated from said relatively cold air stream,

45 said scoop means including rigid air scoop ring means directed obliquely with respect to the flow of air, said valve means controlling the channel branching

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means closing the overflow aperture leading into the air channel section of said lift channel system and simultaneously covering said air scoop ring means against both air streams,

5 said deflection means being so constructed that an acceleration of the air stream already takes place therein.

17. A two-stage gas turbine propulsion jet unit for propelling vertical-start or short-start airplanes, comprising:

10 a first stage forming the base propulsion unit having a flow channel system and constructed as double stage unit, which includes in one stage, air compressor means, combustion chamber means, compressor-drive turbine means, and channel branching means controlled by valve means, and in the other stage, additional compressor means,

15 horizontal thrust channel means extending substantially in the longitudinal axis of said propulsion unit and adapted to be connected with said base propulsion unit by the valve means in said channel branching means,

20 a second propulsion stage forming the lift propulsion unit including a lift channel system discharging into the atmosphere at an angle to said longitudinal axis and lift compressor rotor means having turbine blade means arranged substantially perpendicularly to the longitudinal axis of the unit, said compressor rotor means being operable to draw in atmospheric air for the second propulsion stage forming the lift propulsion unit and supplying air into the lift channel system,

25 said lift channel system having two lift channel branch means including a forward, initially forwardly directed and thereupon downwardly bent first lift channel branch means through which only air of the second lift propulsion stage is adapted to be supplied and a rearward, initially rearwardly directed and thereupon downwardly bent second lift channel branch means which is adapted to be supplied with propellant gases from the base propulsion unit and with air of the second lift stage,

30 the portion of the lift channel system disposed ahead of the bent sections of the lift channel branch means, as viewed in the directional flow through the lift channel system, including a turbine channel section extending substantially co-axially to said thrust channel means and adjoining the channel branching means, and an air channel section surrounding said turbine channel section and provided with air inlet means disposed along the circumference of the propulsion unit,

35 said lift compressor rotor means carrying radially outwardly air compressor blade rim means disposed in said air channel section, radially centrally thereof turbine blade rim means located in said turbine section, and radially inwardly thereof spoke rim means dynamically ineffectual and extending in the horizontal thrust channel means,

40 and further means for deriving the relatively cold air flow supplied by said additional compressor means during lift and transitional operating conditions from the flow channel system of said base propulsion unit and for conducting the same to said first lift channel branch means,

45 the relatively cold air stream being conducted during lift and transitional operating condition into said first lift channel branch means of the lift channel system through a controlled overflow aperture within the area of said channel branching means,

50 and means for substantially matching within the air channel section of said lift channel system the pressure of the relatively cold air stream supplied by said additional compressor means to the pressure of the

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air stream supplied by the forward lift compressor
rotor means, prior to mixing therewith.

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